

# INTERNATIONAL STANDARD

# IEC 61241-1-2

Second edition  
1999-06

---

---

**Electrical apparatus for use in the presence  
of combustible dust –**

**Part 1-2:  
Electrical apparatus protected by  
enclosures and surface temperature limitation –  
Selection, installation and maintenance**

*Matériels électriques destinés à être utilisés en présence  
de poussières combustibles –*

*Partie 1-2:  
Matériels électriques protégés par enveloppes et limitation  
de la température de surface –  
Sélection, installation et maintenance*



Reference number  
IEC 61241-1-2:1999(E)

## Numbering

As from 1 January 1997 all IEC publications are issued with a designation in the 60000 series.

## Consolidated publications

Consolidated versions of some IEC publications including amendments are available. For example, edition numbers 1.0, 1.1 and 1.2 refer, respectively, to the base publication, the base publication incorporating amendment 1 and the base publication incorporating amendments 1 and 2.

## Validity of this publication

The technical content of IEC publications is kept under constant review by the IEC, thus ensuring that the content reflects current technology.

Information relating to the date of the reconfirmation of the publication is available in the IEC catalogue.

Information on the subjects under consideration and work in progress undertaken by the technical committee which has prepared this publication, as well as the list of publications issued, is to be found at the following IEC sources:

- **IEC web site\***
- **Catalogue of IEC publications**  
Published yearly with regular updates  
(On-line catalogue)\*
- **IEC Bulletin**  
Available both at the IEC web site\* and as a printed periodical

## Terminology, graphical and letter symbols

For general terminology, readers are referred to IEC 60050: *International Electrotechnical Vocabulary (IEV)*.

For graphical symbols, and letter symbols and signs approved by the IEC for general use, readers are referred to publications IEC 60027: *Letter symbols to be used in electrical technology*, IEC 60417: *Graphical symbols for use on equipment. Index, survey and compilation of the single sheets* and IEC 60617: *Graphical symbols for diagrams*.

\* See web site address on title page.

# INTERNATIONAL STANDARD

# IEC 61241-1-2

Second edition  
1999-06

---

---

## Electrical apparatus for use in the presence of combustible dust –

### Part 1-2: Electrical apparatus protected by enclosures and surface temperature limitation – Selection, installation and maintenance

*Matériels électriques destinés à être utilisés en présence  
de poussières combustibles –*

*Partie 1-2:  
Matériels électriques protégés par enveloppes et limitation  
de la température de surface –  
Sélection, installation et maintenance*

© IEC 1999 — Copyright - all rights reserved

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

International Electrotechnical Commission  
Telefax: +41 22 919 0300

3, rue de Varembe Geneva, Switzerland  
e-mail: inmail@iec.ch

IEC web site <http://www.iec.ch>



Commission Electrotechnique Internationale  
International Electrotechnical Commission  
Международная Электротехническая Комиссия

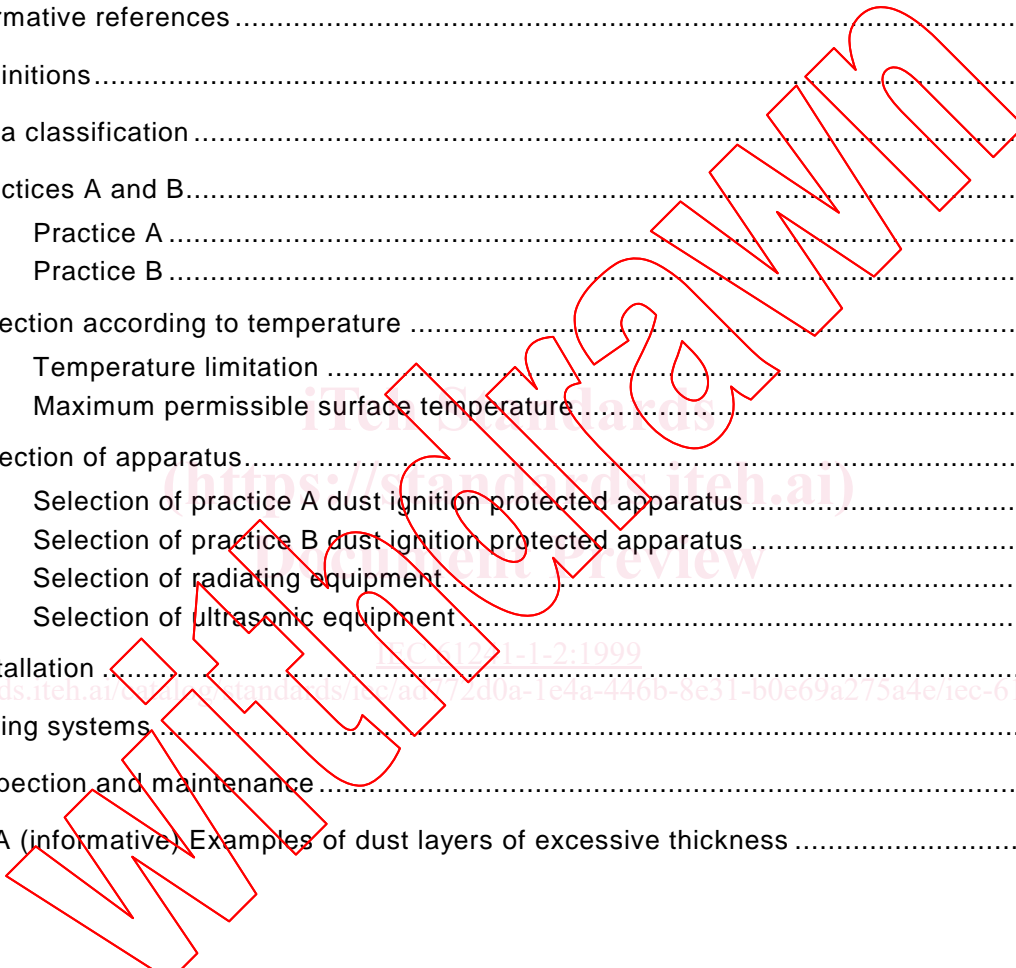
PRICE CODE

**R**

*For price, see current catalogue*

# CONTENTS

	Page
FOREWORD .....	3
INTRODUCTION .....	5
Clause	
1 Scope .....	6
2 Normative references .....	6
3 Definitions .....	7
4 Area classification .....	9
5 Practices A and B.....	9
5.1 Practice A .....	9
5.2 Practice B .....	10
6 Selection according to temperature .....	10
6.1 Temperature limitation .....	10
6.2 Maximum permissible surface temperature.....	12
7 Selection of apparatus.....	12
7.1 Selection of practice A dust ignition protected apparatus .....	12
7.2 Selection of practice B dust ignition protected apparatus .....	13
7.3 Selection of radiating equipment.....	13
7.4 Selection of ultrasonic equipment.....	14
8 Installation .....	14
9 Wiring systems.....	15
10 Inspection and maintenance.....	18
Annex A (informative) Examples of dust layers of excessive thickness .....	19



<https://standards.iteh.ai/standards/iec/61241-1-2:1999>  
<https://standards.iteh.ai/standards/iec/61241-1-2:1999>

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

**ELECTRICAL APPARATUS FOR USE IN THE PRESENCE OF  
COMBUSTIBLE DUST –****Part 1-2: Electrical apparatus protected by enclosures and  
surface temperature limitation –****Selection, installation and maintenance**

## FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
- 3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical reports or guides and they are accepted by the National Committees in that sense.
- 4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
- 5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
- 6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61241-1-2 has been prepared by subcommittee 31H: Apparatus for use in the presence of combustible dust, of IEC technical committee 31: Electrical apparatus for explosive atmospheres.

This second edition cancels and replaces the first edition, published in 1993, and constitutes a technical revision.

The text of this standard is based on the following documents:

FDIS	Report on voting
31H/91/FDIS	31H/97/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

Annex A is for information only.

A bilingual version of this standard may be issued at a later date.

IEC 61241 consists of the following parts under the general title: *Electrical apparatus for use in the presence of combustible dust*:

- Part 1: Electrical apparatus protected by enclosures and surface temperature limitation
- Part 2: Test methods
- Part 3: Classification of areas where combustible dusts are or may be present
- Part 4: Type of protection pressurization "p" <sup>1)</sup>
- Part 5: Intrinsically safe apparatus <sup>1)</sup>

Withdrawing

iTech Standards  
(<https://standards.itih.ai>)  
Document Preview

<https://standards.itih.ai/standards/iec/61241-1-2:1999>

---

<sup>1)</sup> Under consideration.

## INTRODUCTION

Combustible dust can be ignited by electrical apparatus in several main ways:

- by surfaces of the apparatus that are above the minimum ignition temperature of the dust concerned. The temperature at which a type of dust ignites is a function of the properties of the dust, whether the dust is in a cloud or layer, the thickness of the layer and the geometry of the heat source;
- by arcing or sparking of electrical parts such as switches, contacts, commutators, brushes, or the like;
- by discharge of an accumulated electrostatic charge;
- by radiated energy (for example electromagnetic radiation);
- by mechanical sparking or frictional sparking or heating associated with the apparatus.

In order to avoid ignition hazards it is necessary that

- the temperature of surfaces, on which dust can be deposited, or which would be in contact with a dust cloud, is kept below the temperature limitation specified in this standard;
- any electrical sparking parts, or parts having a temperature above the temperature limit specified in this standard
  - are contained in an enclosure which adequately prevents the ingress of dust, or
  - the energy of electrical circuits is limited so as to avoid arcs, sparks or temperatures capable of igniting combustible dust;
- any other ignition sources are avoided.

The protection specified in this standard will not provide the required level of safety unless the electrical apparatus is operated within its rating and is installed and maintained according to the relevant codes of practice or requirements, for example in respect of protection against over-currents, internal short circuits, and other electrical faults. In particular, it is essential that the severity and duration of an internal or external fault be limited to values that can be sustained by the electrical apparatus without damage.

Two different types of practice, A and B, are specified in this standard. Both are intended to provide an equivalent level of protection.

# ELECTRICAL APPARATUS FOR USE IN THE PRESENCE OF COMBUSTIBLE DUST –

## Part 1-2: Electrical apparatus protected by enclosures and surface temperature limitation –

### Selection, installation and maintenance

#### 1 Scope

This part of IEC 61241 gives guidance on the selection, installation and maintenance of electrical apparatus protected by enclosures and surface temperature limitation for use in areas where combustible dust may be present in quantities which could lead to a fire or explosion hazard.

NOTE – IEC 61241-1-1 specifies requirements for the design, construction and testing of electrical apparatus. Apparatus within the scope of this standard may also be subject to additional requirements in other standards – for example, IEC 60079-0.

The ignition protection is based on the limitation of the maximum surface temperature of the enclosure, and other surfaces which could be in contact with dust, and on the restriction of dust ingress into the enclosure by the use of "dust-tight" or "dust-protected" enclosures.

The application of electrical apparatus in atmospheres which may contain explosive gas as well as combustible dust, whether simultaneously or separately, requires additional protective measures.

Where the apparatus has to meet other environmental conditions, for example, protection against ingress of water and resistance to corrosion, additional methods of protection may be necessary. The method used is not to adversely affect the integrity of the enclosure.

The principles of this standard may also be followed when combustible fibres or flyings cause a hazard.

This standard does not apply to dusts of explosives which do not require atmospheric oxygen for combustion, or to pyrophoric substances.

This standard is not applicable to electrical apparatus intended for use in underground parts of mines as well as those parts of surface installations of such mines endangered by firedamp and/or combustible dust. This standard does not take account of any risk due to an emission of flammable or toxic gas from the dust.

This standard does not include other types of protection and is only applicable to protection by enclosures and surface temperature limitation.

#### 2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 61241. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 61241 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60050(426):1990, *International Electrotechnical Vocabulary (IEV) – Chapter 426: Electrical apparatus for explosive atmospheres*



IEC 60079-0:1998, *Electrical apparatus for explosive gas atmospheres – Part 0: General requirements*

IEC 60079-14:1996, *Electrical apparatus for explosive gas atmospheres – Part 14: Electrical installation in hazardous areas (other than mines)*

IEC 60364 (all parts), *Electrical installations of buildings*

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*

IEC 61241-1-1:1993, *Electrical apparatus for use in the presence of combustible dust – Part 1: electrical apparatus protected by enclosures – Section 1: Specification for apparatus*

IEC 61241-2-1:1994, *Electrical apparatus for use in the presence of combustible dust – Part 2: Test methods – Section 1: Methods for determining the minimum ignition temperatures of dust*

IEC 61241-3:1997, *Electrical apparatus for use in the presence of combustible dust – Part 3: Classification of areas where combustible dusts are or may be present*

ISO 4225:1994, *Air quality – General aspects – Vocabulary*

### 3 Definitions

For the purpose of this part of IEC 61241, the following definitions apply.

#### 3.1

##### **dust**

small solid particles in the atmosphere which settle out under their own weight, but which may remain suspended in air for some time (includes dust and grit as defined in ISO 4225)

#### 3.2

##### **combustible dust**

dust, fibres or flyings that can burn or glow in air and could form explosive mixtures with air at atmospheric pressure and normal temperatures

#### 3.3

##### **conductive dust**

dust, fibres or flyings with electrical resistivity equal to or less than  $10^3 \Omega \text{ m}$

#### 3.4

##### **explosive dust atmosphere**

mixture with air, under atmospheric conditions, of flammable substances in the form of dust or fibres in which, after ignition, combustion spreads throughout the unconsumed mixture [IEV 426-02-04]

#### 3.5

##### **minimum ignition temperature of a dust layer**

lowest temperature of a hot surface at which ignition occurs in a dust layer of specified thickness on this hot surface [see IEC 61241-2-1]

### 3.6

#### **minimum ignition temperature of a dust cloud**

lowest temperature of the hot inner wall of a furnace at which ignition occurs in a dust cloud in air contained therein [see IEC 61241-2-1]

### 3.7

#### **dust ignition protection (DIP)**

all relevant measures specified in this standard (for example dust ingress protection and surface temperature limitation) applied to electrical apparatus to avoid ignition of a dust layer or cloud

### 3.8

#### **dust-tight enclosure**

enclosure capable of preventing the ingress of all observable dust particles

### 3.9

#### **dust-protected enclosure**

enclosure in which the ingress of dust is not totally prevented but dust does not enter in sufficient quantity to interfere with the safe operation of the equipment. Dust should not accumulate in a position within the enclosure where it is liable to cause an ignition hazard

### 3.10

#### **maximum surface temperature**

highest temperature which is attained by any part of the surface of electrical apparatus when tested under the defined dust free or blanket conditions

NOTE – This temperature is attained under the test condition. Increasing the layer thickness can increase this temperature due to the thermal insulation properties of dust.

### 3.11

#### **maximum permissible surface temperature:**

highest temperature a surface of electrical apparatus is allowed to reach in practical service to avoid ignition. The maximum permissible surface temperature will depend upon the type of dust, whether as a cloud or layer, if a layer, its thickness and the application of a safety factor

NOTE – For details, see clause 6.

### 3.12

#### **zones**

classified areas are divided into zones based upon the frequency and duration of the occurrence of explosive dust/air mixtures. Dust layers should also be taken into consideration

### 3.13

#### **zone 20**

area in which combustible dust, as a cloud, is present continuously or frequently, during normal operation, in sufficient quantity to be capable of producing an explosive concentration of combustible dust in mixture with air and/or where layers of dust of uncontrollable and excessive thickness can be formed. This can be the case inside dust containment where dust can form explosive mixtures frequently or for long periods of time. This occurs typically inside equipment

### 3.14

#### **zone 21**

area not classified as zone 20 in which combustible dust, as a cloud, is likely to occur during normal operation, in sufficient quantities to be capable of producing an explosive concentration of combustible dust in mixture with air